FINAL REPORT

Microbiological Sampling Report

for

National Oceanic & Atmospheric Administration

Sampling Conducted at the 14th Floor of Building SSMC-3

On November 9 -10, 1999

Interagency Agreement #: D8H00CO31200

Task: 9903

May 15, 2000

Prepared by

US Public Health Service

Division of Federal Occupational Health

Bethesda Central Office

Executive Summary

At the request of the National Oceanic & Atmospheric Administration (NOAA), Federal Occupational Health (FOH) conducted an investigation of window casing areas at Building SSMC-3, located at 1315 East-West Highway, Silver Spring, Maryland. The vacant area located east of column 13 of the 14th floor was selected for a pilot study site. Bulk, swab, and vacuum plenum dust samples were collected from representative areas. Sampling was conducted the evening of November 9, 1999. The objective of this investigation was to determine the extent of drywall contamination in window casing areas especially for *Stachybotrys chartarum* (SC).

Wet ceiling tiles were observed at location M-12.3. Laboratory results from various samples indicated that once water damage occurs, existing fungal spores (i.e. *Penicillium* and/or *Stachybotrys chartarum*)can proliferate on building materials such as gypsum wallboard, fiberglass insulation materials and their exterior paper wrapping, and on surfaces of pre-cast concrete. The longer the water damage persists, the more the fungal proliferation occurs on various surfaces. *Stachybotrys chartarum* was detected from most plenum dust samples collected.

Re-inspection of the cut drywall areas was conducted in the evening of December 10, 1999, a rainy day. Wet drywall was detected on three water damage areas with much higher moisture contents than those of control areas. Results indicate that investigating and remediating water intrusion around window-casing areas in the building is essential for the elimination of fungal proliferation in SSMC-III.

Recommendations are also provided.

INTRODUCTION

At the request of the National Oceanic & Atmospheric Administration (NOAA), Federal Occupational Health (FOH) conducted an investigation of window casing areas at Building SSMC-3, located at 1315 East-West Highway, Silver Spring, Maryland. The vacant area located east of column 13 of the 14th floor was selected for a pilot study site. Bulk, swab, and vacuum plenum dust samples were collected from representative areas. Sampling was conducted in the evening of November 9, 1999. The objective of this investigation was to determine the extent of drywall fungal contamination around window casing areas especially for *Stachybotrys chartarum* (SC).

EVALUATION METHODOLOGY

Field Observation and Sampling

During the on-site visit, all system furniture east of column 13 had been disassembled and laid on the carpeted floor. Stained ceiling tiles were observed at the location M-12.3 (Exhibit 1). Eight sampling areas for drywall were selected near window casing areas based on visual inspection (Attachment A). Visual assessment of these areas is summarized in Table 1. Areas #2, #5, #7, and #8 were selected as control areas where no water damage or fungal growth was detected before the sampling was conducted.

Table 1. Field observations and conditions of each drywall sampling area on November 9, 1999.

Area	Location	Visual Inspection / Field Observations
1	D, 13.2	Visible fungal growth on window casing (Exhibit 2) Chronic water damage area
2	D, 13.8	No visible fungal growth Control area
3	D, 14.7	Visible fungal growth on window casing (Exhibit 3) Chronic water damage area Visible fungal growth on paper wrapping outside of the fiberglass insulation materials
4	16, F.7	No visible fungal growth White patches near window casing (Exhibit 4)

5	16, F.2	No visible fungal growth Control area
6	16, G.3	No visible fungal growth Water damaged area
7	16, J.2	No visible fungal growth (Exhibit 5) Discolored fiberglass insulation materials inside wall cavity
8	15, K.6	No visible fungal growth Control area
9	M, 12.3	Underneath stained ceiling tiles near the window (Exhibit 1)

In each sampling area, a piece of drywall (6 inch x 6 inch) was cut with a utility knife. Each drywall sample was put into a Ziplockâ bag with an identifiable number. The interiors of drywall adjacent to the cut areas were visually inspected with the aid of a flashlight and a hand-held mirror (Exhibit 3, bottom). The wall cavity behind each cut area was visually inspected and two swab samples were taken from the surfaces of concrete pre-cast by wiping a one square inch area with a Culturetteâ. There were 4 inches between the exterior concrete pre-cast and the interior gypsum board drywall. Metal studs and fiberglass insulation materials wrapped with paper/aluminum were observed in the wall cavities except for area #1 (Exhibits 2 & 4). Discolored fiberglass insulation was detected in the wall cavity of area #7. Samples were collected from these materials for analysis and also from control area #8 for comparison. To identify the spore types on the paper wrapping outside of the fiberglass insulation materials, tape-lift samples were also collected from areas #3 and #4.

The entire area east of column 13 area was divided into twelve (12) zones for plenum vacuum dust sampling (Attachment B). Randomly selected ceiling tiles were removed from each zone and dust on the plenum side of ceiling tiles was collected with a High Efficiency Particulate Air (HEPA) vacuum attached with a special “sock” device. For each sampling zone, dust on light fixture surfaces, ducts, and at least twelve ceiling tiles were vacuumed and composited as one sample. All swab and bulk samples collected were sent to FOH’s Environmental Microbiology Laboratory (EML) in Philadelphia, Pennsylvania for analysis.

Laboratory Procedures

Upon receipt, each swab sample was suspended in sterile distilled water, diluted serially, and inoculated onto agar plates. Two media were used for retrieving fungi: 2% malt extract agar (MEA) for general fungi and cellulose Czapek agar (CCA) for cellulose-loving fungi such as *Stachybotrys*. At least three dilution series were used for each sample. Two sub-samples of 1-inch by 1-inch area were cut from the interior surface of each drywall sample received. All bulk samples were weighed and followed the aforementioned dilution plating process. Each dust sample was sieved through a 250 mm sieve. The fine dust (< 250 mm) retrieved was then weighed and followed the dilution plating process for fungal analysis.

All plates were incubated in a 25°C incubator. They were examined every other day for up to 10 days to ensure the full recovery of fungi. Fungal identification was based on colony morphology, spores and conidia formation. Total fungal colonies formed on each MEA plate and SC on CCA plates were counted and recorded. Fungal levels in swab samples were presented as colony forming units (CFUs) per square inch (CFU/in^2). Similarly, fungal levels in bulk and dust samples were presented as CFUs per gram of materials (CFU/g).

Tape-lift samples were sent to the Environmental Microbiology Laboratory in Escondido, California for microscopic examination. Qualitative information was provided for each sample collected (see Attachment C).

RESULTS AND DISCUSSION

All laboratory analytical reports are presented in Attachment C. Results from swab samples collected from surfaces of concrete pre-cast are presented in a laboratory report #NOAA-00-6R. The laboratory report #NOAA-00-7R contains results of vacuum plenum dust samples. Results from all other swab and bulk samples are in a laboratory report #NOAA-00-8R.

Bulk and Tape-Lift Samples

Fungal levels on drywall samples collected from control areas #2, #5, and #8 were very low, and ranged from below the detection limits of 184 CFU/g to 198 CFU/g (Table 2). *Stachybotrys chartarum* was detected on CCA plates at areas #2 and #5.

Table 2. Mean fungal levels and presence of *Stachybotrys chartarum* recovered from bulk drywall samples and swab samples collected from concrete pre-cast, at different areas of the 14th floor, SSMC-3, on November 9, 1999.

	Drywall		Concrete Pre-Cast	
Area	**Fungal level (CFU/g)**	SC*	Fungal level (CFU/in^2)	**SC**
1	92	-	25	-
2	198	+	340	-
3	3.1×10^6	+++	190	++
4	946	+	330	+
5	BDL**	+	400	-
6	1.6×10^6	-	22,540	-
7	1.5×10^5	-	6,225	-
8	BDL	-	775	-
9	4.7×10^4	-	1,180	-

* SC: "+" *Stachybotrys chartarum* was detected on MEA or CCA plates.

"-" *Stachybotrys chartarum* was not detected on either MEA or CCA plates. Levels of SC from low (+) to high (+++).

** Below detection limits of 184 CFU/g.

High fungal levels were detected from the drywall and fiberglass insulation materials collected from area #7. Their respective fungal level was 1.5×10^5 CFU/g, and 4.7×10^4 CFU/g (Exhibit 5). *Penicillium* was the predominant fungal genus recovered from these samples. Though *Stachybotrys chartarum* was not detected from the drywall samples collected from area #7, its presence was detected on CCA plates, from the collected fiberglass insulation materials. As compared to the control area of area #8, fungal proliferation was detected from area #7.

A high fungal level, 1.6×10^6 CFU/g, was detected from the drywall sample collected from area #6. *Penicillium* was the predominant fungal genus recovered from these samples, followed by *Nigrospora* and *Cladosporium*. *Stachybotrys chartarum* was not detected. This was a water-damaged area, even though no visible fungal growth was observed, fungal proliferation behind the wallboards occurred.

Bulk materials collected from the visible fungal growth area of area #1 showed a high fungal level (> 2.5×10^6 CFU/g, sample #3-14-1109B11) and *Stachybotrys chartarum* was detected. However, fungal levels on the interior surface of the drywall sample collected from this area was low (92 CFU/g) and *Stachybotrys chartarum* was not detected. Even though visible fungal growth was observed at area #1, the drywall sample collected from this area was several inches away from the visible growth area (Exhibit 2) and visual inspection did not reveal extensive growth behind the cut drywall area.

The highest fungal level, 3.1×10^6 CFU/g, was detected on the interior surfaces of drywall collected Area 3(Exhibit 3). NOAA personnel identified area 3 as an area chronically affected by water intrusion. *Stachybotrys chartarum* was the predominant fungi detected followed by *Cladosporium*, *Nigrospora*, *Pithomyces*, and *Alternaria.* A high fungal level was also detected from plaster materials showed visible fungal growth near the window casing (> 7.0×10^6 CFU/g, sample #3-14-1109B31). A tape-lift sample collected from area #3 showed fungal growth with *Stachybotrys chartarum* as the predominant fungus followed by *Cladosporium* and *Alternaria.* No fungal growth was observed on the tape-lift sample collected from area #4. Results from sampling conducted in area #3 confirmed fungal, especially *Stachybotrys chartarum*, proliferation in/on various building materials.

White patches were observed on window casing of area #4 (Exhibit 4). Fungal level on drywall was 946 CFU/g. *Penicillium* was the predominant fungal genus followed by *Stachybotrys chartarum* on MEA plates.

The sample collected underneath the stained ceiling tiles showed a fungal level of 4.7×10^4 CFU/g with *Penicillium* as the predominant fungal genus. *Stachybotrys chartarum* was not detected.

Swabs on Pre-cast Concrete Surfaces

Fungal levels on surfaces of concrete pre-cast ranged from 25 CFU/in^2 to 22,540 CFU/in^2 (Table 2). Elevated fungal levels were detected from areas #6, #7, and #9. The predominant fungi recovered from areas #6 and #7 were yeast. Ascomycetes were the predominant fungi recovered from area #9. *Stachybotrys chartarum* was the predominant fungus detected

from area #3.

Plenum Dust Samples

Fungal levels in these plenum fine dust samples were at the levels of $10^3 – 10^4$ CFU/g (Table 3). *Penicillium* and *Aspergillus* species were the predominant fungi detected from these samples. *Aspergillus* species recovered included *Asp. flavus, Asp. fumigatus*, and *Asp. niger*. *Stachybotrys chartarum* was detected on CCA plates from most dust samples, except for zones 2, 6, 7, and 10. Levels of *Stachybotrys chartarum* ranged from 99 CFU/g to 500 CFU/g.

The ceiling plenum in this building serves as a return plenum for the floor's main air handling unit and is an integral component of the heating, ventilation, and air conditioning system. Aforementioned, *Penicillium* and *Stachybotrys chartarum* proliferation was detected on various materials at the window casings of water damage areas. The fungal spores detected in the collected plenum dust may have originated from window casing areas. Consultation with a mechanical engineer who is familiar with the building's heating ventilation and air-conditioning (HVAC) systems is critical to understand the possible pathways of these fungal spores from the wall cavities to the plenum.

Table 3. Fungal levels on vacuum plenum dust samples collected from different zones on East of 14th floor, SSMC-3, on November 9, 1999.

Zone	Location	Total Fungal Levels (CFU/g of fine dust)	Asp-Pen* (%)	SC**
1	J-L, 13-14	2.7×10^4	87	+
2	G-J, 13-14	1.2×10^4	83	-
3	F-G, 13-14	5.6×10^3	93	+
4	D-F, 13-14	4.4×10^3	73	+
5	J-L, 14-15	2.4×10^4	95	+
6	G-J, 14-15	5.6×10^3	93	-
7	F-G, 14-15	1.2×10^4	93	-
8	D-F, 14-15	1.2×10^4	93	+
9	K-J, 15-16	2.2×10^4	76	+
10	G-J, 15-16	1.2×10^4	71	-
11	F-G, 15-16	1.2×10^4	97	+
12	E-F, 15-16	6.7×10^3	82	+

* Asp-Pen = (*Aspergillus* levels + *Penicillium* levels) / total fungal level *100.

** SC: "+" *Stachybotrys chartarum* was detected on MEA or CCA plates.

"-" *Stachybotrys chartarum* was not detected on either MEA or CCA plates.

Reinspection on December 10, 1999

The cut drywall areas were re-inspected in the evening of December 10, 1999, a rainy day. The patched drywall areas of areas #3 and #6 were wet when touched with hands. Readings from a moisture meter (Dri-Eazâ Moisture Counter) indicated a higher moisture content (100%) as compared to other areas (< 10 %) (Exhibits 6 - 8). These findings emphasize the significance of investigating and remediating water intrusion into the building to prevent the recurrence of fungal proliferation on drywall surfaces, on insulating materials inside wall cavities, and on pre-cast concrete.

CONCLUSIONS

· Lower fungal levels (10^2 CFU/g) on drywall surfaces were detected from samples collected from control areas #2, #5, and #8 and an area with patched drywall (area #4). However, low levels of *Stachybotrys chartarum* were detected from areas #2 and 5.

· An elevated fungal level (10^6 CFU/g) was detected from drywall surfaces of a water-damaged area #6 with *Penicillium* as the predominant fungal genus.

· Samples collected from area #7, where no visible fungal growth was detected before sampling, showed elevated fungal levels on drywall surfaces and fiberglass insulation materials in the wall cavity. *Penicillium* as the predominant fungal genus recovered.

· A high fungal level (10^5 CFU/g) was detected from plaster material on the window casing of area #1 showing visible fungal growth. Due to the limited extent of fungal contamination in this area, the fungal level on the drywall sample collected was very low (92 CFU/g).

· *Stachybotrys chartarum* was the predominant fungus detected from samples collected from the chronic water damaged area #3. Samples collected including bulk drywall, wipes on concrete pre-cast, and a tape-lift sample from the exterior wrapping of the fiberglass insulation materials.

· The sample collected from underneath the stained ceiling tiles at area #9 showed elevated (10^4 CFU/g) *Penicillium* proliferation.

· Fungal levels in plenum dust were at $10^3 – 10^4$ CFU/g with *Penicillium* and *Aspergillus* as the predominant fungi.

· *Stachybotrys chartarum* was detected from most of the plenum dust collected.

Results indicated that once water damage occurs, existing fungal spores (i.e. *Penicillium* and/or *Stachybotrys chartarum*) can proliferate on various building materials such as gypsum wallboards, fiberglass insulation, insulation paper wrapping, and on surfaces of pre-cast concrete. As long as water damage persists, fungal proliferation will continue. As fungal proliferation occurs, widespread dispersion of fungal spores may take place if a pathway exists through the air distribution system, resulting in higher remediation costs.

RECOMMENDATIONS

· Remove and replace the stained ceiling tiles at area #9.

· Consult with structural engineers to determine structural defects causing water intrusion in SSMC-II, particularly the areas around window casings.

· Consult with mechanical engineers to evaluate the HVAC systems of this building and investigate potential pathways for fungal spore dispersal from the proliferation sites to ceiling plenums and occupied areas.

· Perform periodic surveillance of window casing areas during rainy days to identify water damage areas.

· Perform periodic inspection of water damage in ceiling plenum areas to prevent any proliferation of existing fungi.

· Permanently fix the water leakage problems to prevent recur of fungal proliferation.

· Implement an emergency water intrusion protocol for this building to adequately manage unexpected water intrusion in order to prevent any fungal proliferation.

Exhibit 1. Stained ceiling tiles at Area 9.

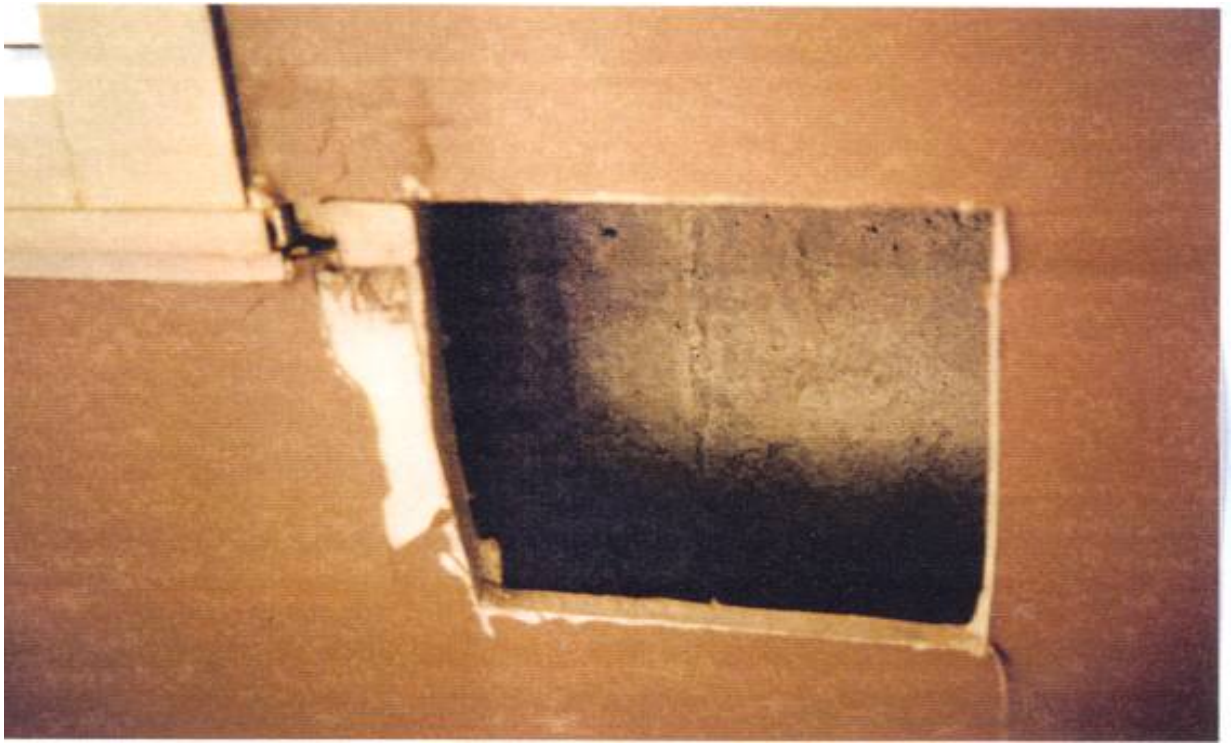


Exhibit 2. Visible fungal growth at window casing of Area 1. No fiberglass insulation materials were observed behind the drywall.

Exhibit 3. Visible fungal growth at window casing Exhibit 3. Visible fungal growth at window casing of Area 3 (Top). Fungal growth was also detected behind the cut drywall (Bottom).

Exhibit 4. White patches at window casing of Area 4 (Top). Metal stud and fiberglass insulation materials with exterior paper wrapping in the wall cavity (Bottom).

Exhibit 5. Control area without visible fungal growth at Area 7.

Exhibit 6. Moisture contents on drywalls of area # 1 on December 10, 1999

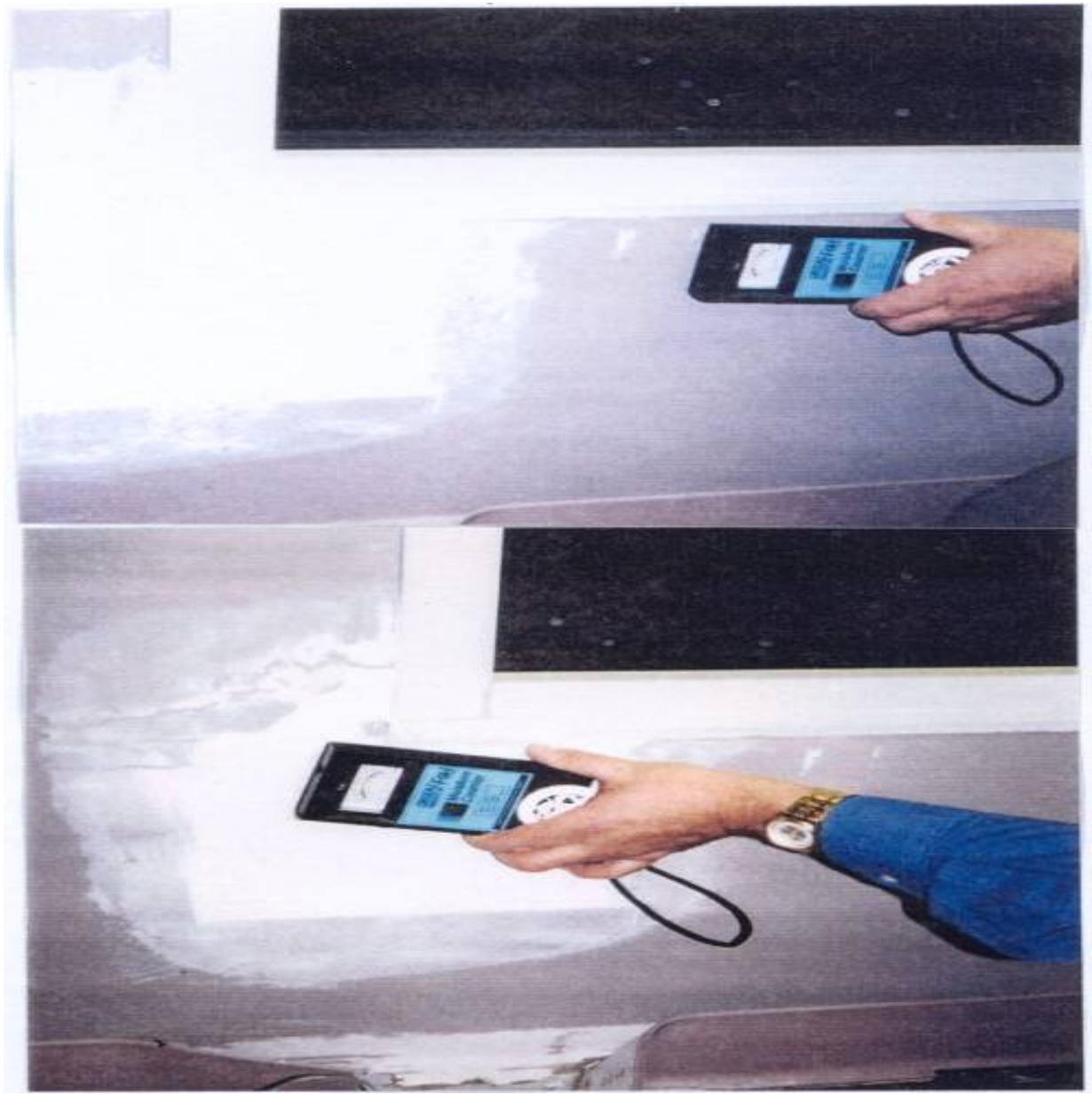


Exhibit 7. Moisture contents on drywall of area # 3 on December 10, 1999

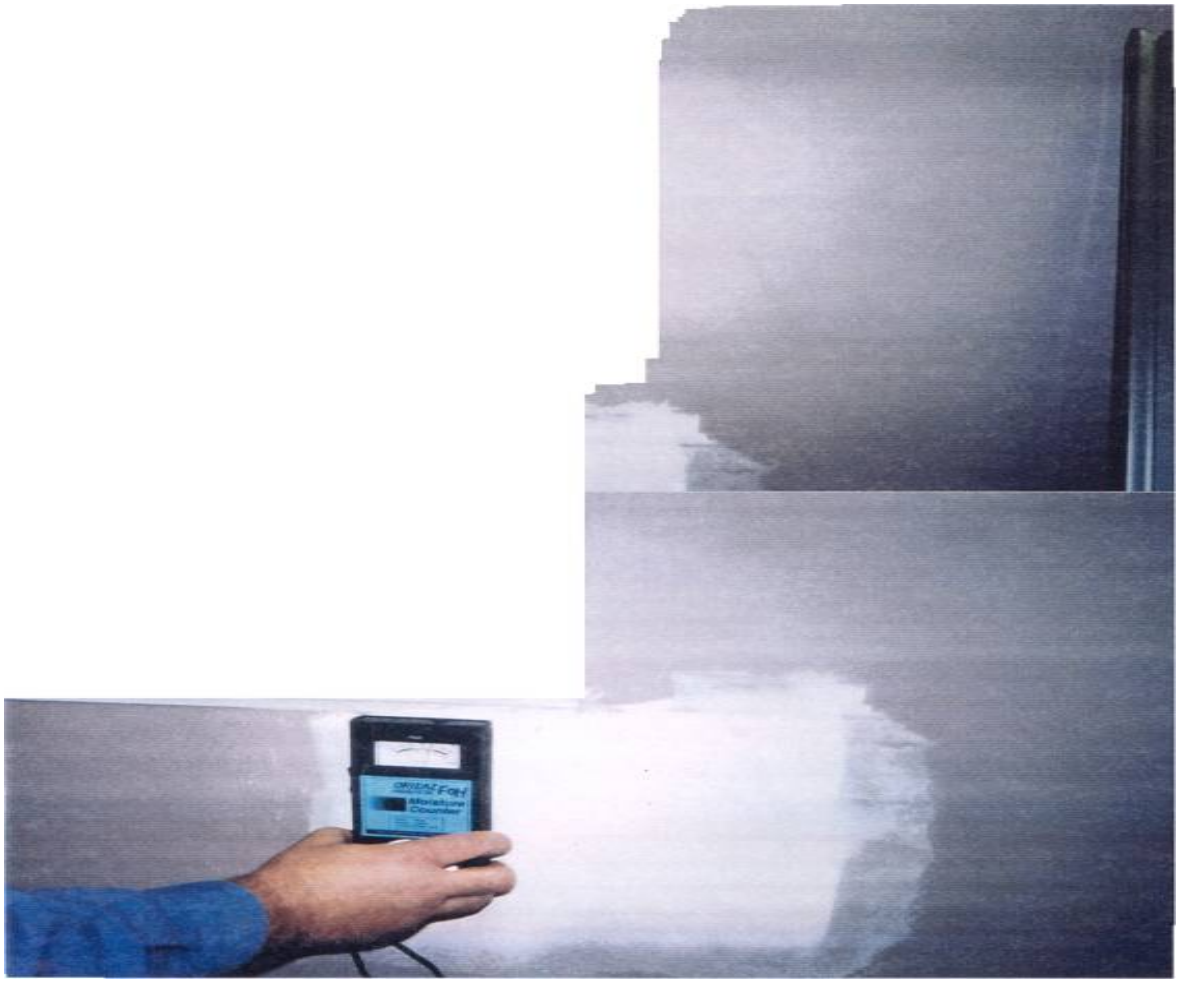


Exhibit 8. Moisture contents on drywalls of area # 6 on December 10, 1999

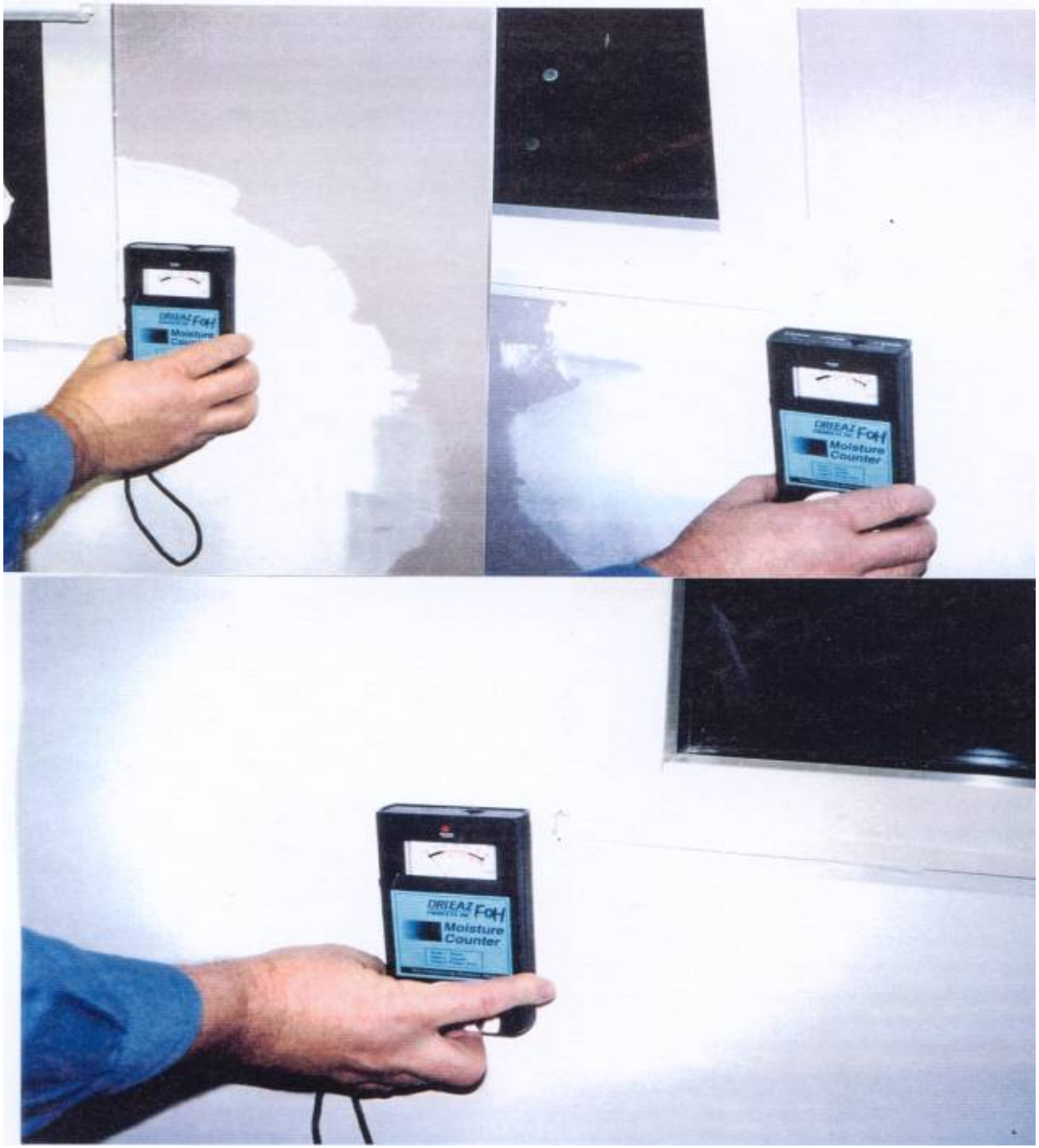
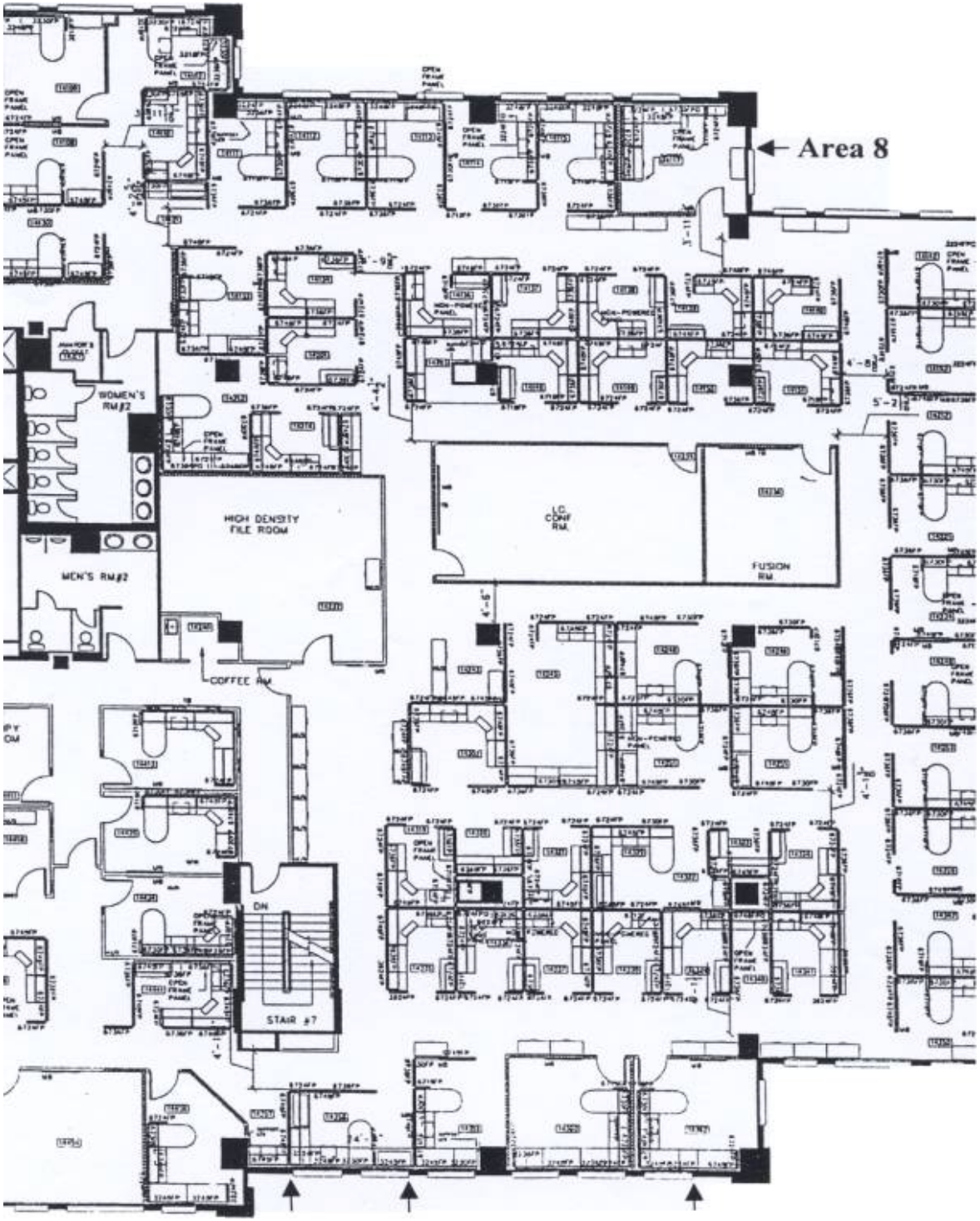


Exhibit 9.Moisture on drywalls of control areas on December 10, 1999.
Area # 4 (top left), area # 7 (top right), and area # 8 (bottom).

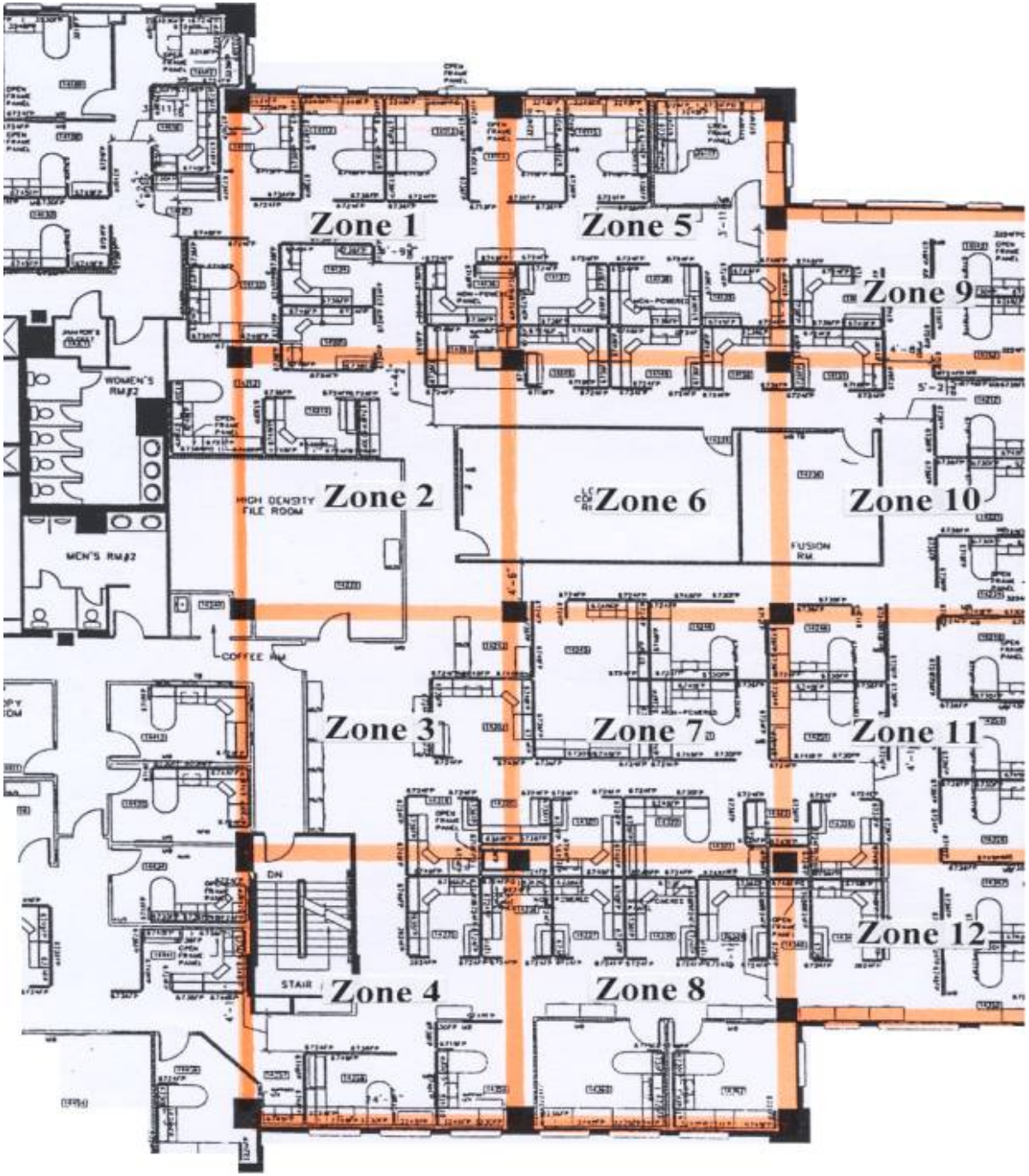
ATTACHMENT A

Sampling areas on East of the 14th floor of SSMC-3 on November 9, 1999


Area 8
WOMEN'S RM #2
MEN'S RM #2
HIGH DENSITY FILE ROOM
LG CONF RM.
FUSION RM.
COFFEE AM
DN
STAIR #7

ATTACHMENT B

Zones for vacuum dust sampling on East of the 14th floor of SSMC-3 on November 9, 1999



III/14th

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-00-6R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD
POIS#/task #: D8H00CO31200 / 9903
Sampling date: 11/9/99
Dates of inoculation: 11/10/99-11/11/99
General location: Silver Spring, MD
Specific location: SSMC-3, 14th floor
Sampling technique: Wipe samplings
Medium used: Malt extract agar (MEA) and cellulose Czapek agar (CCA) for fungi
Samples submitted by: L. Hung and R. Pickett
Date characterization completed: 11/22/99

Wipe samples on MEA and CCA plates

Sample ID	Sampling Location	Area (in^2)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C
3-14-1109W1-1	Wipe on pre-cast @ area 1	1	40X	1. *Penicillium* (1*) CFU/in^2 = 40	No
3-14-1109W1-2	Wipe on pre-cast @ area 1	1	10X	1. *Epicoccum* (1) CFU/in^2 = 10	No
3-14-1109W2-1	Wipe on pre-cast @ area 2	1	10X	1. *Penicillium* (54) 2. Ascomycetes (8) CFU/in^2 = 620	No
3-14-1109W2-2	Wipe on pre-cast @ area 2	1	10X	1. *Penicillium* (4) CFU/in^2 = 40	No
3-14-1109W3-1	Wipe on pre-cast @ area 3	1	10X	1. *Stachybotrys chartarum**** (18) 2. *Nigrospora* (4) 3. *Cladosporium* (3) CFU/in^2 = 250	Yes

Sample ID	Sampling Location	Area (in^2)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C

3-14-1109W3-2	Wipe on pre-cast @ area 3	1	10X	1. *Stachybotrys chartarum**** (8) 2. *Cladosporium* (4) 3. *Penicillium* (1) CFU/in^2 = 130	Yes
3-14-1109W4-1	Wipe on pre-cast @ area 4	1	10X	1. *Penicillium* (1) 2. yeast (7) CFU/in^2 = 80	No
3-14-1109W4-2	Wipe on pre-cast @ area 4	1	10X	1. *Cladosporium* (1) 2. *Penicillium* (1) 3. yeast (56) CFU/in^2 = 580	Yes
3-14-1109W5-1	Wipe on pre-cast @ area 5	1	10X	1. *Penicillium* (4) 2. *Aspergillus versicolor**** (2) 3. Ascomycetes (63) 4. yeast (7) CFU/in^2 = 760	No
3-14-1109W5-2	Wipe on pre-cast @ area 5	1	10X	1. *Penicillium* (3) 2. *Cladosporium* (1) CFU/in^2 = 40	No
3-14-1109W6-1	Wipe on pre-cast @ area 6	1	400X	1. *Cladosporium* (4) 2. *Penicillium* (4) 3. yeast (102) CFU/in^2 = 4.4 x 10^4	No
3-14-1109W6-2	Wipe on pre-cast @ area 6	1	40X	1. *Paecilomyces* (7) 2. Ascomycetes (18) 3. yeast (2) CFU/in^2 = 1,080	No

Sample ID	**Sampling Location**	**Area (in^2)**	**Dilution factor**	**Fungi on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**

3-14-1109W7-1	Wipe on pre-cast @ area 7	1	400X	1. *Aureobasidium* (1) 2. *Penicillium* (1) 3. yeast (29) CFU/in^2 = 1.2 x 10^4	No
3-14-1109W7-2	Wipe on pre-cast @ area 7	1	10X	1. *Penicillium* (2) 2. Ascomycetes (3) CFU/in^2 = 50	No
3-14-1109W8-1	Wipe on pre-cast @ area 8	1	10X	1. *Penicillium* (3) CFU/in^2 = 30	No
3-14-1109W8-2	Wipe on pre-cast @ area 8	1	40X	1. *Paecilomyces* (1) 2. yeast (37) CFU/in^2 = 1,520	No
3-14-1109W9-1	Wipe on pre-cast @ area 9	1	40X	1. *Alternaria* (1) 2. Ascomycetes (31) CFU/in^2 = 1,280	No
3-14-1109W9-2	Wipe on pre-cast @ area 9	1	40X	1. Ascomycetes (25) 2. *Paecilomyces* (1) 3. *Penicillium* (1) CFU/in^2 = 1,080	No

* Colony counts.

*** Toxigenic fungi.

Characterization completed by: Ling-Ling Hung, Ph.D. Microbiologist

Quality control checked by: **CP** (initials)

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-00-7R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD

POIS#/task #: D8H00CO31200 / 9903

Sampling date: 11/9/99

Date of inoculation: 11/12/99

General location: Silver Spring, MD

Specific location: SSMC-3, 14th floor

Sampling technique: Plenum dust samplings

Medium used: Malt extract agar (MEA) and cellulose Czapek agar (CCA) for fungi

Samples submitted by: R. Pickett and J. Sobelman

Date characterization completed: 11/22/99

Plenum dust samples on MEA and CCA plates

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C
3-14-1109D01	Vacuum dust on plenum, area 1	0.101	40X-MEA 10X-CCA	1. *Penicillium* (51*) 2. *Cladosporium* (6) 3. *Aspergillus sp.* (5) 4. *Aspergillus niger*** (4) 5. *Paecilomyces* (1) 6. Basidiomycetes (2) CFU/g = 2.7×10^4	Yes (1) CFU/g = 99
3-14-1109D02	Vacuum dust on plenum, area 2	0.100	40X-MEA 10X-CCA	1. *Penicillium* (18) 2. *Aspergillus niger*** (4) 3. *Alternaria* (2) 4. *Aspergillus sp.* (2) 5. *Aureobasidium* (1) 6. *Cladosporium* (1) 7. *Neurospora* (1) CFU/g = 1.2×10^4	No CFU/g < 100

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C

3-14-1109D03	Vacuum dust on plenum, area 3	0.100	40X-MEA 10X-CCA	1. *Penicillium* (8) 2. *Aspergillus niger*** (4) 3. *Aspergillus flavus**** (1) 4. Basidiomycetes (1) **CFU/g = 5,600**	Yes (3) CFU/g = 300
3-14-1109D04	Vacuum dust on plenum, area 4	0.101	40X-MEA 10X-CCA	1. *Aspergillus niger*** (4) 2. *Penicillium* (3) 3. *Aspergillus sp.* (1) 4. *Chaetomium* (1) 5. *Paecilomyces* (1) 6. *Rhizopus* (1) **CFU/g = 4,356**	Yes (3) CFU/g = 297
3-14-1109D05	Vacuum dust on plenum, area 5	0.101	40X-MEA 10X-CCA	1. *Penicillium* (44) 2. *Aspergillus niger*** (7) 3. *Aspergillus flavus**** (3) 4. *Paecilomyces* (3) 5. *Aspergillus sp.* (2) 6. *Aspergillus fumigatus*** (1) CFU/g = 2.4×10^4	Yes (2) CFU/g = 198
3-14-1109D06	Vacuum dust on plenum, area 6	0.100	40X-MEA 10X-CCA	1. *Aspergillus niger*** (6) 2. *Penicillium* (5) 3. *Aspergillus sp.* (2) 4. *Cladosporium* (1) **CFU/g = 5,600**	No CFU/g < 100

Sample ID	**Sampling Location**	**Weight (g)**	**Dilution factor**	**Fungi on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**

3-14-1109D07	Vacuum dust on plenum, area 7	0.101	40X-MEA 10X-CCA	1. *Penicillium* (16) 2. *Aspergillus niger*** (8) 3. *Aspergillus flavus**** (3) 4. *Paecilomyces* (2) 5. *Aspergillus fumigatus*** (1) CFU/g = 1.2×10^4	No CFU/g < 99
3-14-1109D08	Vacuum dust on plenum, area 8	0.100	40X-MEA 10X-CCA	1. *Penicillium* (18) 2. *Aspergillus niger*** (7) 3. *Aspergillus sp.* (2) 4. *Aspergillus fumigatus*** (1) 5. *Cladosporium* (1) 6. Basidiomycetes (1) CFU/g = 1.2×10^4	Yes (1) CFU/g = 100
3-14-1109D09	Vacuum dust on plenum, area 9	0.100	40X-MEA 10X-CCA	1. *Penicillium* (34) 2. *Alternaria* (5) 3. *Aspergillus niger*** (4) 4. *Cladosporium* (4) 5. *Aspergillus sp.* (2) 6. *Aspergillus flavus**** (1) 7. *Aureobasidium* (1) 8. *Fusarium* (1) 9. *Paecilomyces* (1) 10. Basidiomycetes (1) CFU/g = 2.2×10^4	Yes (5) CFU/g = 500

Sample ID	**Sampling Location**	**Weight (g)**	**Dilution factor**	**Fungi on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**

3-14-1109D10	Vacuum dust on plenum, area 10	0.100	40X-MEA 10X-CCA	1. *Penicillium* (115) 2. *Alternaria* (6) 3. *Aspergillus niger*** (5) 4. *Paecilomyces* (3) 5. *Aspergillus flavus**** (2) CFU/g = 5.2×10^4	No CFU/g < 100
3-14-1109D11	Vacuum dust on plenum, area 11	0.101	40X-MEA 10X-CCA	1. *Penicillium* (14) 2. *Aspergillus niger*** (9) 3. *Aspergillus flavus**** (3) 4. *Aspergillus sp.* (3) 5. *Alternaria* (1) CFU/g = 1.2×10^4	Yes (2) CFU/g = 198
3-14-1109D12	Vacuum dust on plenum, area 12	0.101	40X-MEA 10X-CCA	1. *Penicillium* (7) 2. *Aspergillus sp.* (4) 3. *Aspergillus niger*** (3) 4. *Alternaria* (2) 5. Basidiomycetes (1) **CFU/g = 6,733**	Yes (1) CFU/g = 99

* Colony counts.

** Opportunistic fungi.

*** Toxigenic fungi.

Characterization completed by: Ling-Ling Hung, Ph.D. Microbiologist

Quality control checked by: ____CP____(initials)

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-00-8R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD

POIS#/task #: D8H00CO31200 / 9903

Sampling date: 11/9/99

Date of inoculation: 11/12/99

General location: Silver Spring, MD

Specific location: SSMC-3, 14th floor

Sampling technique: Bulk samplings

Medium used: Malt extract agar (MEA) and cellulose Czapek agar (CCA) for fungi

Samples submitted by: L. Hung and R. Pickett

Date characterization completed: 11/22/99

(A) Bulk samples on MEA and CCA plates

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C
3-14-1109B01-1	Drywall @ area 1	0.217	40X	1. *Paecilomyces* (1*) **CFU/g = 184**	No
3-14-1109B01-2	Drywall @ area 1	0.215	40X	No fungal growth CFU/g < 186	No
3-14-1109B02-1	Drywall @ area 2	0.223	40X	No fungal growth CFU/g < 179	No
3-14-1109B02-2	Drywall @ area 2	0.202	40X	1. *Aureobasidium* (1) 2. Ascomycetes (1) **CFU/g = 396**	Yes
3-14-1109B03-1	Drywall @ area 3	0.205	4,000X	1. *Cladosporium* (94) 2. *Stachybotrys chartarum**** (74) 3. *Nigrospora* (17) 4. *Pithomyces* (3) CFU/g = 3.7×10^6	Yes

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C
3-14-1109B03-2	Drywall @ area 3	0.207	4,000X	1. *Stachybotrys chartarum**** (62) 2. *Nigrospora* (49) 3. *Cladosporium* (21) 4. *Alternaria* (2) CFU/g = 2.6×10^6	Yes
3-14-1109B04-1	Drywall @ area 4	0.208	40X	1. *Penicillium* (8) **CFU/g = 1,538**	No
3-14-1109B04-2	Drywall @ area 4	0.226	40X	1. *Penicillium* (1) 2. *Stachybotrys chartarum**** (1) **CFU/g = 354**	No
3-14-1109B05-1	Drywall @ area 5	0.200	40X	No fungal growth CFU/g < 200	Yes
3-14-1109B05-2	Drywall @ area 5	0.217	40X	No fungal growth CFU/g < 184	No
3-14-1109B06-1	Drywall @ area 6	0.203	4,000X	1. *Penicillium* (38) 2. *Nigrospora* (18) 3. *Cladosporium* (9) 4. *Pithomyces* (1) CFU/g = 1.3×10^6	No
3-14-1109B06-2	Drywall @ area 6	0.201	4,000X	1. *Penicillium* (85) 2. *Cladosporium* (9) CFU/g = 1.9×10^6	No
3-14-1109B07-1	Drywall @ area 7	0.209	400X	1. *Penicillium* (19) 2. *Nigrospora* (3) 3. *Pithomyces* (1) CFU/g = 4.4×10^4	No

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Presence of *Stachybotrys chartarum**** on CCA @ 25°C

3-14-1109B07-2	Drywall @ area 7	0.201	400X	1. *Nigrospora* (85) 2. *Penicillium* (39) 3. *Paecilomyces* (1) CFU/g = 2.5 x 10^5	No
3-14-1109B08-1	Drywall @ area 8	0.210	40X	No fungal growth CFU/g < 190	No
3-14-1109B08-2	Drywall @ area 8	0.215	40X	No fungal growth CFU/g < 186	No
3-14-1109B09-1	Drywall @ area 9	0.213	40X	1. *Penicillium* (86) 2. *Cladosporium* (1) CFU/g = 1.6 x 10^4	No
3-14-1109B09-2	Drywall @ area 9	0.204	400X	1. *Penicillium* (40) CFU/g = 7.8 x 10^4	No
3-14-1109B11	Area 1, exterior surface, visible mold growth area @ window casing	0.635	4,000X	1. *Alternaria* (3) 2. Ascomycetes (> 400) CFU/g > 2.5 x 10^6	Yes
3-14-1109B31	Area 3, visible mold growth on window casing	0.227	4,000X	1. *Fusarium* (11) 2. *Alternaria* (1) 3. Ascomycetes (> 400) CFU/g > 7.0 x 10^6	No
3-14-1109B71	Water damaged fiberglass insulation material @ area 7	0.655#	400X	1. *Penicillium* (45) 2. *Nigrospora* (15) 3. *Paecilomyces* (7) 4. *Alternaria* (2) 5. *Pithomyces* (1) 6. yeast (7) CFU/g = 2.4 x 10^4	Yes

Sample ID	**Sampling Location**	**Weight (g)**	**Dilution factor**	**Fungi on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**

3-14-1109B81	Control fiberglass insulation materials @ area 8	0.637#	40X	1. *Aspergillus sp.* (1) 2. *Penicillium* (1) 3. yeast (1) **CFU/g = 94**	No

(B) Direct plating of bulk samples on MEA and CCA plates

Sample ID	**Sampling Location**	**Fungi detected on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**
3-14-1109B11	Area 1, exterior surface, visible mold growth area @ window casing	*Alternaria*## *Fusarium*	No
3-14-1109B31	Area 3, visible mold growth on window casing	*Fusarium*## *Rhizopus* *Stachybotrys chartarum****	Yes
3-14-1109B41	Area 4, paper wrapping outside of fiberglass insulation material	*Alternaria* ## *Aspergillus niger*** *Aspergillus sp.* *Penicillium* *Pithomyces* *Stachybotrys chartarum****	Yes

Sample ID	**Sampling Location**	**Fungi detected on MEA @ 25°C**	**Presence of *Stachybotrys chartarum**** on CCA @ 25°C**
3-14-1109B71	Water damaged fiberglass insulation material @ area 7	*Alternaria* ## *Paecilomyces* *Penicillium* yeast	Yes

* Colony counts.

*** Toxigenic fungi.

20ml of sterilized distilled water were added instead of 10ml.

Fungi presented in alphabetical order.

Characterization completed by: Ling-Ling Hung, Ph.D. Microbiologist

Quality control checked by: __CP___(initials)